From Seals to People – What H5N1 in Patagonia Foretells

Tue, May 13, 2025

SUMMARY KEYWORDS
H5N1, bird flu, marine mammals, elephant seals, virus transmission, zoonotic outbreak, wildlife surveillance

SPEAKERS

Marcela Uhart, Maggie Fox

Maggie Fox 00:00
Hello and welcome to One World, One Health, where we chat with people working to solve the biggest problems facing our world. I am Maggie Fox. This podcast is brought to you by the One Health Trust with bite-sized insights into ways to help address challenges, such as infectious diseases, climate change, and pollution. We take a One Health approach that recognizes that we are all in this together and everything on this planet — the animals, plants, people, and the climate and environment — are all linked.

You can't find a better example of these connections than bird flu. H5N1 avian influenza has spread completely around the world in recent years, moving from birds to a range of species, including foxes, cats, and cattle. It has infected at least 70 people in the U.S. and killed at least one, and the damage to poultry has helped drive up the price of eggs. This virus hasn't proven especially deadly among people yet, and it doesn't seem to spread from person to person, but it's changing and mutating so that it can infect mammals more easily.

Dr. Marcela Uhart is keeping an eye on all of this. Dr. Uhart is Director of the Latin America Program at the University of California, Davis. She studies wild animals, especially marine wildlife, in Latin America. She and her colleagues recently investigated a huge outbreak of H5N1 that killed more than 17,000 elephant seals in Argentina. Dr. Uhart is joining us to talk about what she found and what it means for all of us.

Dr. Uhart, thank you for joining us.

Marcela Uhart 01:32
Thank you for having me. My pleasure.

Maggie Fox 01:35
You found evidence that elephant seals, sea lions, and other marine mammals are spreading H5N1 to one another. Can you tell us a little bit about what you found?

Marcela Uhart 01:46
Yes, so that was a surprise. We were suspicious about the case because the outbreak had been spreading across many countries in South America, including from north to south on the Pacific coastline, and then from south to north on the Atlantic coastline of South America.

When we were able to get our hands on samples from the animals that were dying during this outbreak, we were able to confirm that was effectively the case, that the virus that we were finding in individual marine mammals, individual elephant seals and sea lions was identical, suggesting that the virus was going from one to the other. Also, just how massive the outbreaks were, over a few days only. There's no way that individual events that we call spillovers. So, when a bird virus goes individually to one single mammal, that could not happen. You know, 18,000 animals individually each time, that is highly unlikely.

Maggie Fox 02:47
People usually think of influenza as a respiratory virus, but among birds, it's spread by bird droppings. Can you tell us a little bit about that?

Marcela Uhart 02:57
Yeah, so that's a great question. So, the reservoirs of this type of influenza virus in nature are wild birds, specifically waterfowl. Waterfowls live in water environments, so an efficient way for them to spread the virus is through feces, and then the virus stays viable in the water, and then it gets ingested by others, and that's how there's exposure for many individuals next to them.

And also, there's an issue with their receptors by which they get infected. How does that virus bind to the body and cause infection? So, their system is prepared for an infection that runs through the gut, mostly to the digestive tract. So that's why this fecal transmission makes sense for them. Conversely, for humans, then we have specific receptors for influenza viruses in our respiratory tract, and we tend to interact with on another by being in closer proximity, and that is why we get efficient transmission of any flu virus, that we know of, through respiratory droplets, coughing, the sneezing, etc.

Maggie Fox 04:03
And by receptors, I just want to make this clear. These are structures on your cells, on your cells, where the virus kind of docks and can infect the cell

Marcela Uhart 04:12
Exactly. It's like a key to a lock system, right? So, it's just a mechanism by which the virus can infect any species, and it's just the difference there. And you know, the risk here is that, over time, the virus may evolve. What it's trying to do is to find mechanisms to be able to adapt to these other receptors and

then become infected by other, more efficient means. And it may be, we don't know yet, that there was some of that already in the transmission between individual marine mammals. It is unlikely that fecal transmission was the most likely route of infection for these species as well. So, there may be some of that happening.

Maggie Fox 04:55
So, that's what I want to ask you, because we're talking about the spreading of birds and the virus. Persists in the water. How did the virus get from birds to sea mammals? Was it floating around in the water?

Marcela Uhart 05:06
The virus doesn't live very long in seawater. That is not a good environment for it. Fresh water is much better, but you know, it can still survive a little bit. So, there is a possibility that some of that was the case. It could be close interactions with birds, of course, to get that initial transmission.

But then also, what we must think is that when these marine mammals are on land, which is rare, especially for elephant seals, who spend 90 percent of their life in the deep ocean, when they're on land, they're very closely aggregated. They live in very dense aggregations, one on top of the other. They interact with each other all the time. This happened during the breeding season, so there's a lot of fighting and very close contact. So, there's also a very high potential for respiratory or even saliva transmission, and we saw lots of interactions between species, including sea lions and elephant seals, where they could have been biting and other ways of close contact and transmission, but that remains to be, you know, better understood.

Maggie Fox 06:13
So, there's a poorly understood situation where, at some point, a bird infected a seal, and then the seal started infecting another.

Marcela Uhart 06:23
Yeah, so that happened early on, from what we know, when the virus arrived in South America, it arrived in Peru, this strain, and it did make several jumps into marine mammals, and we have those documented, but those were dead ends. They made one individual bird into a mammal jump, and it stayed there.

Then one of these viruses had enough mutations in it that it was able to catch on in the marine mammals. So, the virus that we saw in Argentina with elephant seals had already been spreading through Peru, through Chile, and finally came to Argentina with that capacity already to be transmissible between mammals, and then it continued to the North to Uruguay and Brazil along the coast of the Atlantic and South America. So, it has spread across at least five countries already efficiently within marine mammals themselves.

Maggie Fox 07:18
I'm interested in the mother-to-cub transmission. Does this tell us anything about milk carrying the virus?

Marcela Uhart 07:25
Yeah, you know, that is the million-dollar question. So, of course, when we investigated this outbreak, we did not know that cows were going to become infected, and that milk was going to be such an important thing. You know, we're thinking again, your first question was, it is usually transmitted in birds by feces, and in humans by aerosols and respiratory, and then we come to this milk situation, which you've never seen for an influenza virus before, right?

So, this was completely out of the blue. It caught us off guard with the cows. And then, well, retrospectively, I wish we could have, we would have thought about that, especially because with elephant seals, babies were dramatically affected. That was the group that was most affected and died. So, it is potentially possible that mothers were infected and then gave the virus to their infants through milk and nursing. You know, should a second outbreak occur, we will sample them out to see if that is happening, but at that time, we did not know.

What we did see, however, is that some species, such as sea lions, were having abortions. So, they were aborting their fetuses before term, and those fetuses were loaded with the virus. So, at least there's some potential also for some transmission during gestation. So it could be that the unborn pops were already infected in Europe, and could have been born, already infected, and then they developed the disease very rapidly. So, all of that is up in the air.

Maggie Fox 08:55
We still don't know something to keep an eye on as the virus moves into more species of animals and potentially into people.

Marcela Uhart 09:01
Absolutely, yes. Mammals have all these interesting additions to the equation that we don't normally think of with avian influenza.

Maggie Fox 09:10
You have called this latest global outbreak, this zoonotic a “global stress test.” What do you mean by that?

Marcela Uhart 09:17
Yeah, so that is a common term that we use when we prepare for disease outbreaks or pandemics, etc. So, when we prepare for these big events, we kind of test how well our systems for responding are. So, “Are we prepared for a response to a massive outbreak?” “Are we prepared for a response to the first evidence of efficient human-to-human transmission when there's a cluster that we detect?” So, this is what it means. This stress testing is our surveillance to keep up to speed. You know, and then if we do

detect it, “Are we ready to prepare rapidly, would we be able to hit the ground running?” So do we have a vaccine, and the pipeline that we could potentially pull out quickly, and things that particularly now are very relevant, because we very recently went through a very traumatic experience with COVID-19, so we would assume that we learned something from that, and that this time, we wouldn't be caught off guard. In these health scenarios, call these intervals between outbreaks “peace time.”

So, this is when it's quiet, and then this is when we must make sure that we are prepared if something changes very dramatically, because usually the changes happen very quickly, right?

Maggie Fox 10:35
So, what you're doing is a part of the puzzle. But why should anyone study elephant seals in the southern hemisphere? What's that got to do with the rest of the world?

Marcela Uhart 10:47
I would say that we study elephant seals because we love them. They’re of crucial importance, so the ecosystems on the ocean, and conservation of wildlife and ecosystems are critical for all of us and the planet, right?

But beyond that, for this disease, what we can learn from what happens in wildlife is crucial. This is a virus that mostly moves around the wildlife sector in this piece of the puzzle. So that is where these viruses evolve and where they may be changing faster than we can detect in domestic animals or humans.

So, there's a key role here in what we call surveillance. So, it is extremely relevant that we continue to look at what's happening in the wild. Because beyond the elephant seals themselves, the virus is moving through other wildlife populations, and in each one of these, it is evolving and adapting and acquiring new characteristics. So, for example, the new H5N1 genotype D1.1 has now been proven to be deadly to humans’ multiple times. So, it caused a human case in Louisiana. It caused a human case in Mexico recently, and it almost killed a person in Canada. That new genotype also infecting cows and dairy cows.

So, what does that mean? And the only way we've known of this is because we're doing this kind of surveillance in the wildlife itself, and that's where we need to look, because we can control how people move. We can control how domestic animals move, or how they behave, to some extent, because we're growing them for food. But wildlife can do whatever they wish. They go free, roaming around the world, they could easily carry these more dangerous genotypes to other countries, to other regions, etc, and allow the virus to become something bigger than what it is now.

The H5N1 B 3.2 genotype that we have in South America has been extinct in North America for over a year now. It is No Longer circulating here anymore. So already, just in the Americas, we see two very distinct evolutionary pathways, right? They're not even related anymore.

Then this H5N1 D 1.1 has emerged, and now it's taking over these B genotypes that were prevalent before that, and this is what this virus is trying to do. If you're a virus that cannot have an independent life outside of a host, you need to find ways you evolve and maintain yourself, hopefully not killing your host. You just want to be more transmissible. So that's kind of where this play of evolution is happening, where the virus is probably trying to find ways that it can sustain infection within mammals or any other species, not necessarily killing everybody, but becoming more efficient in this process.

So, one of the most intriguing mechanisms by which this happens is one sort of transformation of their genes, which is reassortment, which is when one single individual gets infected with two different viruses at the same time, and those two viruses exchange pieces of the genetic material. So actually, the virus that caused the outbreak in South America, that is, stems from a genotype that emerged in North America from the combination of the virus that arrived from Europe, with gene pool from viruses that were endemic in North America that created a new virus that is the one that then migrated and caused this mass mortality in marine mammals. So, we've seen this at play like every so often within the last three years. It's just pretty amazing how rapidly these changes can happen.

Maggie Fox 14:21
And of course, people struggle to understand this, because there is this concept that the viruses don't want to kill their hosts. After all, that means the virus has died. But there's an intermediate period where, I mean, the viruses don't consciously know what they're doing. They just mutate sporadically, and there's no rhyme or reason to it, and they could mutate into a form that's both transmissible and deadly. How might people be contributing to this spread among animals?

Marcela Uhart 14:47
Particularly with the domestic animals we are, I would say, almost entirely responsible for how the virus is spreading. So, in poultry, of course, that relates to the biosecurity of those farms. So that means how well they maintain their flock separated from any, you know, wild birds outside of there, but also how the people working within those facilities is protected, and then also how we make sure that people working in one facility don't carry the virus inadvertently in their clothes, their shoes, etc, to another farm where those same people work.

A little bit of that is what seems to have happened in the dairy cow industry, where people not only move from one farm to the other, and potentially they are carrying the virus, but also that we move the cows from one place to the other, and then have been moving the virus without knowing from one location to the next, so we've been responsible for a lot of that transmission within the domestic animal with wildlife, it's a little bit more complex, obviously, because we don't decide where, waterfall go and when, etc, but we do often create ideal situations for them to be exposed.

So, for example, you know, around poultry farms or dairy farms, there are often little ponds, little creeks that, you know. So, the waterfall tends to come there because their wetlands are gone, so that this is one few places that they have. And then, of course, on the farms themselves, there's food. So, you know, there's waste that is spilled out or whatever. And the birds can go there and forage, and that

there's everything they need is right there. It's like going to the supermarket for them, so that makes it ideal for them to want to come to these sites more. So, we create conditions that are good for them. And then sometimes, when we get scared about that, it happens where we create noise, or we go and shoot, and something like that, that scares the birds away. So that means that if anybody was infected, then they're taking that infection to other places, and we're again responsible for that transmission just by shooing the birds away and just sending the problem to another location.

Maggie Fox 16:52
What does all this mean for conservation as well? Can H5N1 drive a species out of existence or put it on the edge?

Marcela Uhart 16:59
Yes, it can. I mean, it's, it's showing us that it can so, for example, one of the species that was most hit in South America were Peruvian pelicans that was already an endangered species, after the massive outbreak that wiped out more than 60 percent of its entire population and the first outbreak in 2022 and 2023 this species was listed as critically endangered, and now, after skipping a year (because there was nobody left), they have tried to sit down and read again and again, they have been hit by an outbreak. So, it is very likely that this species is going to go into some very severe issues going forward, if anybody does survive. Hopefully, there are enough animals that haven't been exposed, or that have been exposed and survived, so that they're immune and carry on this, but they're going to be left on the edge.
The other example I'll give you is the case of the elephant seals that for our monitoring for over 30 years in the area where this outbreak occurred, and we know that the population was increasing. It was a conservation success story. In conservation, we call those “least concern,” right? These are the animals that are doing okay despite other things, like climate change and interactions with fisheries, which are added threats.

But what we saw from this massive outbreak was not only the mortality of all the pups in that one season, but what we are seeing now, last year, since we continue monitoring, is that it appears that many adult breeding females were also killed. So that means that by our recent estimates, it'll be at least “70 years”- seven zero years before this population is back on track to what it used to be in 2022, before avian influenza hit them, and it could be even longer than that. So, 2100 or something, before the population is back to where it should have been naturally. And so, this means that the population was the least concerned. Maybe now it is vulnerable, actually, to extinction.

So, if we add all of these other things that you know are coming at the same time, or that will have another outbreak of avian influenza next year, or whenever the virus is now circulating very broadly, this could be very impactful for many species.

And the virus is now in Antarctica; we may assume that it is the continent where we should have the lowest footprint on the planet. And most of the species there are endemic to that region. That means they live there and nobody anywhere else on the planet, and they play crucial roles in the ecosystems

down there that then feed all the rest of our oceans, which regulate our climate. The oceans produce half of the oxygen that we breathe every day.

So, we think of the Amazon forest, but the ocean is just as critical. So, you know, if we lose these functional ecosystems beyond the species themselves, we can all be in very big trouble, right? We wouldn't want to be there, but the situation now is of huge concern.

Maggie Fox 20:00
Dr. Uhart, thank you so much for taking the time to chat with us about this.

Marcela Uhart 20:05
Thank you very much. This is nice to do. Thanks listeners.

Maggie Fox 20:09
Listeners. If you enjoyed this podcast, please share it. You can learn more about this podcast and other important topics at onehealthtrust.org, and let us know what else you would like to hear about at owoh@onehealthtrust.org. Thanks for joining us.